bearing on its inner surface the seminal organ, which is also bulb-shaped and tapers above into a long spine-like corneous process; relative length of legs 2, 4, 1, 3; cephalothorax and abdomen together, of ♂ 7 millims., of ♀ 8 millims.

I have to thank the Rev. O. P. Cambridge for referring me to the genus of this species.

7. *Gasteracantha madagascariensis*?, var.

Gasteracantha madagascariensis, Vinson, Aran. de la Réunion, Maurice et Madagascar, p. 242, pl. ix. fig. 6 (1863).

In coloration the example sent agrees far better with *G. mauritia* of Walckenaer, the cephalothorax and femora being reddish castaneous, the tibiæ and tarsi black, the abdomen above (in the spirit-example sent) buff-yellow, with black spines and depressed spots ("sigilla," Cambr.), below black spotted with yellow. The Rev. O. P. Cambridge thinks it more probably a variety of *G. madagascariensis*; and if this be so, I see no reason why the latter should not be conspecific with *G. mauritia*, since the difference of form, so far as I can judge, seems to be very slight between these two spiders.

As regards the strange modification of pattern which must have taken place if this be in truth a pale variety of *G. madagascariensis*, I may mention that, so far as can be determined from dried specimens, *G. flavomaculata* seems to show a tendency towards a similar modification.

EXPLANATION OF PLATE I.

Fig. 1. *Pasithea foliifera*, Butl. (twice the natural size). 1 *a*. Profile view of the same, slightly enlarged.
Fig. 2. *Attus Bewsheri*, Butl. (twice the natural size). 2 *a*. The same, in profile.
Fig. 3. *Attus Johannæ*, Butl. (twice the natural size). 3 *a*. The same, in profile. 3 *b*. Male palpus, much enlarged.
Fig. 4. *Attus anjuanus*, Butl. (twice the natural size). 4 *a*. The same, in profile.
Fig. 5. *Spermophora comoroensis*, Butl. (twice the natural size). 5 *a*. The same, in profile. 5 *b*. Male palpus, much enlarged.

IV.—*On* Plocamia plena, *a new Species of Echinonematous Sponge*. By W. J. Sollas, M.A., F.G.S., &c.

[Plates VI. & VII.]

Plocamia plena, n. sp. (Pl. VI.)

(Examined in the dry state.)

Sponge fan-shaped (Pl. VI. fig. 1): a horizontal incrusting base (*b*), $\frac{1}{20}$ inch thick, smooth and irregular on the under sur-

face, areolate on the upper, growing proliferously upwards into simple stem-like processes (*s*) and a thin wide flabellate expansion (*f*). The latter, which is seated on a short stout stalk, is formed apparently by the union of a number of simple stems, which, fusing together basally, give rise to the stalk, and then, diverging and branching radiately upwards and outwards, produce the fan-like plate, on which their course is marked by radiating ridges costating both surfaces of the plate, while the lines along which they unite are indicated by radiating furrows left between the ridges. These furrows are frequently bridged over by irregular transverse connexions, and thus become converted into series of deeper or shallower irregular pits. Two open window-like spaces (*f*) perforating the midst of the plate are due to the failure of the component ribs in these places to unite. The lower half of the incrusting base and the central two thirds of the stems and ribs grey in colour and dense and compact in texture; succeeded by an irregularly cavernous, sulphur-yellow, intermediate layer, which supports a thin drab dermal membrane, through which, in places, a number of large pointed spicules project, rendering the surface hirsute (Pl. VI. fig. 2).

Skeleton. The hard parts are those of the axis or base, of the intermediate and dermal layers, and of the sarcode.

Axial spicules with a smooth cylindrical shaft, terminated at each end by a spherical microspined inflation, 0·0075 inch long, 0·0005 inch diameter (Pl. VI. fig. 4); confusedly entangled together in a felt-like manner (Pl. VI. fig. 2).

Intermediate spicules of two kinds:—(i.) a long, robust, curved, conical acuate, sharply pointed at one end and generally spherically inflated at the other, inflation usually smooth (Pl. VI. fig. 3), sometimes minutely spined (Pl. VII. fig. 8); length 0·041 inch, diameter of shaft 0·0018 inch, of head 0·002 inch; collected in short columns, projecting at right angles from the axial core, in the external layer of which the inflated ends of some of the spicules are imbedded (Pl. VI. fig. 2); (ii.) a smaller curved, spined acuate, 0·01 inch long, 0·001 inch broad, pointed at one end, inflated spherically at the other, spines on inflation blunt (Pl. VII. fig. 16), or pointed, with the points directed from the head to the other extremity of the spicule (Pl. VII. fig. 17); spines of the shaft commencing about the middle of its length, and extending within a short distance of its point, conical, recurved, numerous; inflated heads of the spicules imbedded in the axial cord or in the penicillate columns of larger acuates, pointed ends projecting echinately (Pl. VI. fig. 2).

Dermal simple, straight, conical acuates, rounded obtusely

at one end, seldom inflated, sharply pointed at the other (Pl. VI. fig. 6 and Pl. VII. fig. 28); rounded end smooth, sometimes sparsely microspined (Pl. VII. fig. 27), 0·015 inch long, 0·0004 inch broad; arranged matted together felt-like, supported on the ends of the large intermediate acuates, about which they sometimes accumulate in a tent-like projection (Pl. VI. fig. 2).

Sarcode. Flesh-spicules of two kinds, both very minute, not exceeding 0·0003 inch in length—one a tricurvate (Pl. VI. fig. 7 and Pl. VII. fig. 19, *b*), the other an equianchorate, with a straight or curved shaft and three recurved minute arms at each end (Pl. VI. fig. 7 and Pl. VII. fig. 19, *a*), dispersed through bright yellow sarcode.

Hab. Marine.

Loc. West Africa, lat. 15° S.

Coll. Bristol Museum, presented by John Thwaites, Esq

Obs. The single specimen of this sponge is in a very perfect state of preservation, having been well dried without losing its sarcode. How it was obtained by Mr. Thwaites, and from what depth in the sea, there is nothing to show; but its occurrence on the western side of Africa so far south as 15° from the equator is interesting, since both Oscar Schmidt's* species of *Plocamia* came from the other side of the Atlantic and north of the equator, viz. one from Florida at a depth of 195 fathoms (*P. gymnazusa*), and the other from Cuba at a depth of 270 fathoms (*P. clopetaria*).

It is clear from O. Schmidt's definition of the genus *Plocamia* that our form must be referred to it; and this reference is made all the more certain by the close general agreement between *P. plena* and the two previously described species, both in structure and spiculation. In *P. gymnazusa*, O. S., there is a large acuate in the intermediate layer, like that of *P. plena*; but our spined echinating acuate is represented by a smooth form without spines; the needle-like spicules of the dermis appear to be present in both, as well as the dumbbell-headed, handle-like spicules of the axis. O. Schmidt does not make any mention of flesh-spicules; but as in *P. plena* these are very minute, it is just possible that, if present in the other forms, they may have escaped his attention.

Putting these on one side, then, the distinction between *P. gymnazusa* and *P. plena*, so far as it can be learned from description merely, appears to lie chiefly in the different form of the echinating acuates:—in the latter a richly spined, straight, or curved acuate with an inflated head; in the former a smooth,

* Grundzüge einer Spongienfauna des atlantischen Gebietes, pp. 62, 80, Taf. iv. figs. 17, 18.

abruptly bent acuate, sharply pointed at one end and merely rounded off at the other. In *P. clopetaria*, O. S., a fat clumsy tuberculated spicule is said to be characteristic, and travesties rather than represents our echinating acuate.

As regards the affinities of the genus, O. Schmidt considers it related on one hand to the Suberites, and on the other to the genus *Clathria*. That it is a true echinonematous sponge (*i. e.* allied to *Clathria*) there is no doubt; and certainly the spicules of the axial column and lower part of the base are arranged in a very suberitic fashion. The scopiform bundles of acuates in the intermediate layer remind one of *Microciona*; and if one added to the membranous base of the latter a layer of felted spicules, the resemblance would become almost complete, especially as *Myxilla*, which in at least some of its species is identical with *Microciona*, frequently grows upwards into stalked processes, which appear to resemble those of *P. plena*.

In the relation of the scopiform bundles of spicules to the axial columns of the sponge, *Plocamia* shows some similarity to *Dictyocylindrus ramosus*, Bwk.; but the latter has not the spicular dermal layer which occurs in the former. In *Phakellia* the dermal layer is present, but the scopiform bundles are replaced by long plumose fibres. Thus the affinities of the sponge are all with Echinonematous forms; and it should apparently be referred to the family Ectyonidæ, where it will form a group by itself, viz. the Plocamianina, with the following definition:—Sponge growing proliferously upwards from an incrusting base; skeleton consisting of axial columns of dumb-bell-headed spicules supporting scopiform bundles of large acuates, which, as well as the axial columns, are echinated by smaller acuates of another form, the exterior provided with a dermal spicular covering, and the sarcode containing very minute flesh-spicules.

Order ECHINONEMATA, Carter.

Family **Ectyonidæ**, Carter.

Group *Plocamianina*, Sollas.

Genus Plocamia, O. Schmidt.

Species: 1. *Plocamia gymnazusa*, O. S.

2. *Plocamia clopetaria*, O. S.

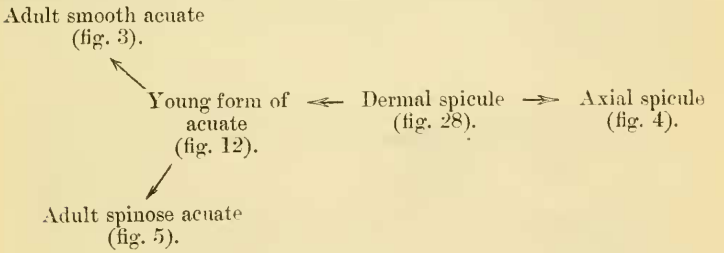
3. *Plocamia plena*, Soll.

It is worthy of notice that no horny material is discoverable

in these sponges. O. Schmidt says that none is present in the two species he had examined; and to determine whether there might not be some in mine I mounted a few slices of the sponge in glycerine jelly, which makes the siliceous spicules almost invisible, and so brings into greater distinctness the other parts. The sarcode was thus rendered very visible; but no keratacеous material could be detected. The sarcode, we may mention, soon parted with some of its intense yellow colouring-matter to the surrounding medium, which thus at first assumed a yellow tint that has since almost entirely disappeared. By the absence of horny matter in it *Plocamia* does not quite meet the requirements of Carter's definition of his order; but this is a small point of difference; and from the examination of a large number of Echinonematous sponges I am inclined to think that the presence or absence of horny matter is not of ordinal value, or, more properly, that the passage from a spiculose horny fibre, whether echinated or not, to a wholly spicular not horny fibre is so gradual that it is impossible to draw a hard-and-fast line between the two, and that, just as a Renierid may be regarded as a Holorhaphidote development of a Chalinid, so there may be sponges among the Echinonemata which may be regarded as Holorhaphidote developments of the Ectyonidæ; and such I believe is the nature of *Plocamia* for one, not to mention others.

If we adopt a monophyletic origin for the various forms of spicules found in *Plocamia* and other sponges, we shall naturally be led to look for some evidence of this amidst the wide variations which the spicular forms assume; and such evidence is, I think, to be readily found. In the first place, leaving out of account the flesh-spicules, of which we know too little at present, and which may have a separate origin to the others, one observes a close family likeness in all the forms of spicules to be found in *Plocamia*: thus, though they differ considerably in proportion, they all present a conical or cylindrical form, without any tendency to become fusiform, they all exhibit a tendency to acquire spines, and they all vary in the same kind of way. The dermal spicules, for instance, often acquire an inflated head, and, though usually very straight, sometimes become slightly curved; on the other hand, the large intermediate acuates sometimes lose their terminal inflation and so present merely a rounded-off end, and, though usually curved, they sometimes become straight; while in both dermal and intermediate acuates the head often becomes more or less spined. The only constant difference which distinguishes these two forms thus lies only in size and proportion; and even in the latter character variation occurs,

the intermediate acuates becoming thinner and the dermal acuates thicker, and so approaching the one to the other. Hence I see no difficulty in believing that the spicule-cell of the larger acuate is a direct descendant of that of the dermal spicule. Again, the dermal spicule sometimes becomes rounded off at both ends, and in one instance was observed with an inflation at each end, each inflation being sparsely microspined (Pl. VII. fig. 20); on the other hand, the dumbbell-like axial spicule loses one of its inflations, retaining the other, so that at one end it possesses a spherical head, and at the other is merely rounded off (Pl. VII. fig. 26), or terminated sometimes by a blunt mucrone (Pl. VII. fig. 25), which, however, still retains its microtuberculation, though the tubercles exhibit a tendency to acquire the characters of small spines; again, the axial spicule varies much in proportional length, being sometimes very short and stumpy, like Pl. VII. fig. 21, and at others elongating and narrowing till one has the attenuated form, Pl. VII. fig. 22, very similar in proportion to one of the dermal spicules. Thus the passage of a dermal spicule into one of the dumbbell-like forms is by no means inconceivable. As regards the spined echinating spicules, these exhibit as many variations as the others; the extent to which the pointed end is spined is very inconstant, some forms remaining almost smooth (Pl. VII. fig. 13, for instance), in which case they closely resemble the young spinose-headed forms (Pl. VII. fig. 12) of the intermediate acuates, from which they might easily have been derived. Our theory of the relationship between these various spicules may be expressed in the following diagram:—



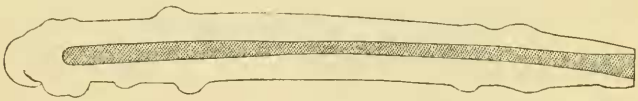
Of other variations displayed by the spicules one may notice the tendency, very frequently displayed by the large acuates, to exchange the pointed for a rounded extremity, thus passing into the cylindrical spicule, Pl. VII. fig. 9; and this may be combined with a general stunting in linear growth, which leads to such forms as figs. 10, 11, Pl. VII., and might, if carried far enough, give us a truly globular

form as the end of the series. It would not do, however, to regard such a globular spicule as in any way resembling the balls of the Geodidæ; for in the latter the growth is purely radiate, in the former as purely concentric; one is an overgrown stellate spicule, the other an aborted acuate; and the difference between them is made very manifest by treatment with boiling alkali, the *Geodia*-globule dissolving rapidly from the centre outwards, the *Plocamia*-cylinder obdurately resisting all solution and never admitting the potash to its interior.

Finally, the acuates sometimes become bent upon themselves, to the extent of 90° or much more (Pl. VII. fig. 18); and as bending usually foreshadows branching, so we sometimes find a spicule putting forth a spine-like branch near its extremity, into which enters correspondingly a branch from the axial canal; such a bifurcation of the end of one of these acuates carries us much nearer the trifid spicules of the Pachastrellidæ and Pachytragidæ than the bi- and trifurcation in the echinating spicules of *Plectronella*, since in the latter it is the head end which is so divided, while here, as in the groups just mentioned, it is the pointed end of the spicule.

In conclusion we have to consider the behaviour of the spicules when treated with boiling solution of potash. The spined acuates under these circumstances readily dissolved both within and without, in just the same manner as uniaxial spicules usually do; and I was able to make quite certain that no branches were supplied to the spines by the axial canal; the spines are merely local thickenings of the exterior of the spicule, not aborted branches as is the case with *Plectronella*.

Fig. 1.

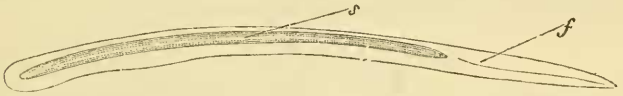


Echinating acuate after treatment with boiling potash (× 435).

The dumbbell spicules and the large acuates with both ends rounded seldom underwent internal solution, unless they had been broken across so as to make the axial canal accessible. Solution of the exterior proceeded rapidly, coat after coat of the acerates being removed, and, indeed, of the dumbbell forms as well, exposing the successive forms through which they had passed during their growth; and it is worth mentioning

that the forms so revealed were always similar to that of the spicule from which they were derived, a conical acuate always remaining a conical acuate, and a stunted cylindrical one always remaining stunted and cylindrical; and thus Bowerbank's notion that the latter are young forms of the former, and would become pointed and conical with growth, is refuted; the cylindric are aborted, not immature forms of the acuates. The statement that residual acuates are of the same or similar form to the original ones may appear difficult to verify, since when the outer coat has been removed there is nothing left to show what the form originally was; and since the solution takes place while the spicules are being boiled, one cannot witness the removal of a coating. That is true: but it is a remarkable fact that solution does not wholly remove the outer coat; in other words, the solution is partial only; for after the potash has dissolved away the silica of one of the envelopes there remains behind a less soluble residue, which has the appearance of a delicate, soft, membranous film, and which retains very closely the original form of the envelope from which it was derived. Thus in fig. 2 we have a sketch

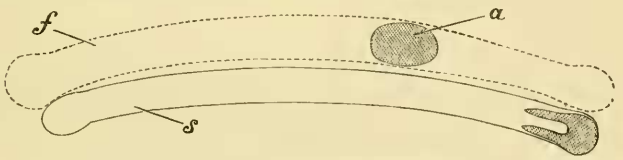
Fig. 2.



Smooth acuate after treatment with potash (× 140). *s*, residual spicule; *f*, residual membrane.

of the residual film of an acuate enclosing within its slightly folded, delicate, almost invisible substance (*f*) the solid, strongly defined spicule (*s*). In fig. 3 an axial spicule is represented with the residual film of an outer envelope washed

Fig. 3.



Axial spicule after boiling with potash. *s*, remainder of spicule; *f*, outer sheath separated from it; *a*, air-bubble (× 435).

from it and lying on one side; the air-bubble (*a*) within this sheath indicates the tenuity of its walls.

What, then, is the nature of this residual substance, which,

though presenting a strangely organic appearance, is yet able to resist the effects of boiling solution of alkali? From the fact that some small pieces of cork, which were accidentally present with the boiling spicules, had not suffered any marked decomposition, nothing more than a separation, to a certain extent, of their cells, it occurred to me that it might be a form of cellulose, which is known to occur now in various groups of animals, and which would not be an unlikely accompaniment to the green colouring-matter (probably chlorophyll) which characterizes some kinds of sponges. On testing with Schulze's solution, however, the membrane was not coloured, while the associated fragments of cork became stained of a deep violet; on exposing to a high temperature it appeared to become carbonized; it did not affect polarized light. These are the only observations I have made with regard to this substance at present; my next step will be to submit some sponge-spicules to organic analysis; till then I regard the composition of their organic foundation as an open question.

The heads of the axial spicules appear to suffer far more from solution than their shafts, the whole interior of a head being sometimes eaten out without the shaft showing any evident signs of solution. Can this in any way be connected with the micro-tuberculation of the heads?

Fig. 4.

Two of the double-headed axial spicules after boiling with potash (× 435). Shaded parts indicate the cavities which have been excavated by solution.

From the cavity thus excavated in the head, the potash sometimes finds its way into the axial canal; but quite as often it dissolves a path for itself outside the site of the axial canal down each side of the spicule.

EXPLANATION OF THE PLATES.

Plate VI.

Plocamia plena.

Fig. 1. *Plocamia plena* (nat. size). *b*, incrusting base; *s*, single upright stem; *r*, a rib of the fan-like expansion cut across (the fan is

incomplete on this side); *f*, an opening in the fan, left between two diverging ribs. From a photograph.

Fig. 2. Section across the base of fig. 1 (magnified about 50 diameters).

Fig. 3. Large acuate of the intermediate layer.

Fig. 4. Dumbbell-like spicule of the base or axis.

Fig. 5. Spined echinating acuate.

Fig. 6. Needle-like spicule of the dermal layer. The head is a little too inflated to be normal.

Fig. 7. Equianchorate and tricurvate spicules of the sarcode.

Figs. 3–7 all magnified 140 diameters.

PLATE VII.

Varieties of the spicules of *P. plena*.

Fig. 8. Common variety of the large acuate, with a spinose head.

Fig. 9. Common variety of the large acuate with the distal end rounded off.

Fig. 10. A similar but extremely stunted form.

Fig. 11. A variety intermediate between those of figs. 9, 10.

Fig. 12. A young form of the large acuate, with spined head.

Fig. 13. A nearly spineless variety of the echinating acuate.

Fig. 14. Similar, but with a larger number of spines.

Fig. 15. Spined acuate, bent abruptly to one side.

Figs. 8–15 are all magnified 140 diameters.

Figs. 16, 17. Normal forms of spined echinating acuates (× 435).

Fig. 18. Large smooth acuate, bent upon itself hook-like (× 140).

Fig. 19. Flesh-spicules. *a*, equianchorates; *b*, tricurvates. × 435.

Fig. 20. Dermal spicule with both ends inflated and microspined (× 435).

Fig. 21. Short stout form of axial or dumbbell spicule.

Fig. 22. Attenuated form of the same spicule.

Fig. 23. Same kind of spicule bent upon itself at right angles.

Fig. 24. Same spicule, doubly inflated at one end.

Fig. 25. Same spicule, with one end rounded off and produced into a blunt mucrone.

Fig. 26. Similar, but without the mucrone.

Figs. 21–26 all magnified 140 diameters.

Fig. 27. Head of a dermal spicule, magnified 435 diameters, to show the minute spines.

Fig. 28. Ordinary dermal needle (× 140).

Fig. 29. Normal dumbbell form (× 435).

V.—*On the Occurrence in North America of rare Extinct Vertebrates found fragmentarily in England.*—No. 2. By Prof. R. OWEN, C.B., F.R.S., &c.

[Plate VIII.]

[Continued from ser. 5, vol. ii. p. 223.]

Part III. RESTORATION OF *LEIODON ANCEPS*.

IN the section on Mosasauroids, in the "Report on British